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## Modern Surgery - Chapter 27. Diseases and Injuries of the Abdomen - The Liver and Gall Bladder

John Chalmers Da Costa  
*Jefferson Medical College*

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countered in subphrenic abscess. The proof of the diagnosis is not, however, obtained until an exploratory incision has been made and the purulent matter has been examined. In many cases the abscess-cavity contains gas as well as fluid. Empyema and subphrenic abscess resemble each other. In empyema the upper limit of the fluid is concave; in subphrenic abscess it is convex. In empyema the flow of pus through an aspirating-needle will be most marked during expiration; in abscess, during inspiration. The same is true of the rush of gas. In empyema the needle does not oscillate; in abscess it does.\* If an abscess contains gas percussion elicits a tympanitic note over a part of the cavity and there is an alteration in the area of tympany with an alteration in the position of the patient. An abscess of the liver does not contain gas and decidedly changes the outlines of the organ.

**Treatment.**—Incision and drainage. The incision in some cases may be made in the lumbar region, in some cases through the abdominal wall (epigastric region, iliac region, hypochondrium). In other cases the chest-wall is incised, the ninth or tenth rib is resected, and the abscess is opened below the pleura or the pleura is opened, and the diaphragm is incised. If appendicitis is the cause, be sure the appendicitis is well; and if not, open and drain freely (Elsberg). If it is necessary to open the pleural sac, try to stitch the parietal to the visceral layer of the pleura, or, if this is impossible, protect the cavity with iodoform gauze to prevent infection.

#### THE LIVER, GALL-BLADDER, AND BILE-DUCTS.

**Rupture and Wounds of the Liver.**—Rupture of the liver is due to very great force, and is usually accompanied by injury of other viscera. It may be produced by a blow, by a fall, or by the end of a broken rib. The superior surface or margin most often suffers. It is a very fatal accident. Out of 543 reported cases, over one-half died of hemorrhage within twenty-four hours of the accident.† Wilms ‡ collected 19 cases, and only 3 recovered after operation. An attempt should be made to save the patient by opening the abdomen and arresting hemorrhage, and in a suspected case an exploratory operation should be performed. A wound of the liver causes violent hemorrhage which is usually rapidly fatal. Such a wound is apt to divide bile-ducts and allow bile to escape into the peritoneal cavity. Bile if sterile will do little harm, but if it contains bacteria it will produce diffuse peritonitis. The symptoms of a rupture or wound of the liver are those of severe intra-abdominal hemorrhage, with collapse and hepatic tenderness. Soon after the injury the abdomen is soft and flat, but it quickly becomes rigid and ultimately distended. The diagnosis becomes more probable when it is known that violence was applied in the hepatic region. Usually there is abdominal pain and often pain in the back. Sugar may appear in the urine. Jaundice seldom arises. The area of liver-dulness is usually increased. Patients do not always die from a serious traumatism of the liver. Some recover because operation has been performed. Some few recover without operation. This last fact is proved by reports of autopsies in which scars were found in the liver-parenchyma (Nussbaum). The fatality which usually

\* Wharton and Curtis, "Practice of Surgery."

† Mercade, in *Rev. de Chir.*, Jan. 10, 1902.

‡ *Deut. med. Woch.*, Nos. 34 and 35, 1901.

ensues on a liver injury may be due to hemorrhage or peritonitis. If a surgeon is called to a patient suffering from wound of the liver, he must open the abdomen to arrest hemorrhage. If a penetrating wound is suspected, it may be desirable to enlarge the wound in the abdominal wall layer by layer, in order to determine that the liver is wounded. If the left lobe of the liver is wounded, or if it is uncertain which lobe is wounded, the incision should be median. If the right lobe is wounded, a curved incision is made along the line of the costal cartilages. In some cases these two incisions are joined.\* The convex surface of the liver can be reached by Lannelongue's plan. Lannelongue resects the eighth, ninth, tenth, and eleventh costal cartilages and draws the ends of the ribs well out. When the wound in the liver is discovered and well exposed deep sutures of catgut should be inserted in the liver and the capsule should be stitched with fine silk (Schlatter). If sutures fail to arrest hemorrhage, the liver should be sutured to the belly-wall and the wound in the liver packed with iodoform gauze. It is useless to try packing without first attaching the liver to the abdominal wall, because pressure will simply push the liver away and will not arrest the bleeding. The cautery is a very useful means of arresting bleeding. It should be avoided if possible in a large wound, because, even if it arrests primary hemorrhage, secondary hemorrhage may occur. After arresting hemorrhage wash out the abdomen with hot saline fluid, insert drainage, and close the abdominal wound. In a case of the author's in the Philadelphia Hospital the liver was wounded by the sharp ends of fractured ribs. The abdomen was opened, a wound was found, and bleeding was arrested by suturing the liver to the belly-wall and packing the wound. The patient died, and necropsy showed another wound on the posterior portion of the organ. The possibility of such an occurrence should not be lost sight of.

**Tumors and Cysts of the Liver.**—The liver may be the seat of primary carcinoma, sarcoma, or endothelioma, of angioma, lymphangioma, adenoma, fibroma, myxoma, or lipoma. Secondary malignant growths are far more common than primary neoplasms. The frequency of cancer of the liver secondary to cancer of the stomach has already been alluded to; in fact, nineteen-twentieths of cases of cancer of the liver are secondary. The commonest primary tumor of the liver is cavernous hemangioma. It is especially apt to take origin in the atrophying liver of an elderly individual.

Among the cysts occurring in the liver are blood cysts, congenital cysts, bile cysts, and hydatid cysts.

Angiomata have been removed successfully by hepatectomy, a cautery being used to cut through the normal liver tissue around the base of the tumor. Enucleation is not feasible because of excessive hemorrhage. In a pedunculated case the base may be encircled by an elastic ligature held in place by a steel needle, and five or six days later the tumor may be cut across with the cautery.†

Carcinoma of the liver has been extirpated, but it is seldom that a growth is recognized early enough and is found sufficiently limited to justify such a procedure.

\* See Schlatter, *Beiträge zur klinischen Chirurgie*, Bd. xv, Heft ii, 1896.

† Russell S. Fowler on "Tumors of the Liver," *Brooklyn Medical Journal*, Dec., 1903.



**Hydatid cysts of the liver** may be of small size and productive of no signs or symptoms; or may be of large size and productive of the signs of tumor. In the epigastrium the mass may be prominent and may fluctuate. In cyst of the right lobe the dulness is found in the axillary line and the growth encroaches on the pleura. In a large cyst fluctuation and hydatid fremitus may exist. Hydatid fremitus is a vibration imparted to the palpating fingers of one hand when the fingers of the other hand knock upon the cyst. There may be no discomfort produced by even a large cyst, but, as a rule, the patient suffers from a dragging sensation in the epigastrium and pressure-symptoms. Suppuration in the cyst produces the symptoms of abscess of the liver and septice-mia. Rupture of the cyst produces shock, and even death. Rupture may take place into the pleural sac, the lung, or the peritoneal cavity. If the shock is recovered from, inflammation arises, the area of which depends upon the structures damaged. The escape of even a small quantity of hydatid fluid into the peritoneal cavity produces urticaria (hydatid toxemia). Aspiration for diagnostic purposes is not advisable.

**Treatment.**—Exploratory incision may be necessary to confirm the diagnosis, and the operation is completed at this time. After exposing the cyst it is packed around with gauze and a trocar is introduced. When the fluid is evacuated the sac is incised and is drawn partly through the wound in the abdominal wall, and is attached to the wound-margins (marsupialization). The endocyst can be removed by the hand or by irrigation. A large drainage-tube is introduced. If there is a considerable thickness of liver-tissue over the cyst, incise the liver with the cautery knife.

**Abscess of the Liver.**—An abscess of the liver may be produced by bacteria, especially staphylococci and streptococci. These organisms reach the liver by the general circulation, or, what is more frequent, are taken up from the intestinal tract and reach the liver by the portal circulation. The fact that abscess of the liver is in hot countries frequently preceded by amebic dysentery has led to the presumption that *amœba coli* produces the abscess. Habitual intemperance and constant overeating predispose to abscess of the liver. The disease may follow traumatism, dysentery, diarrhea, cholangitis, suppuration of a hydatid cyst, gall-stones, typhoid fever, appendicitis, and a chill to the surface of the body.\* Abscess of the liver may be metastatic, and such abscesses are multiple. It may be caused by foreign bodies and parasites. A tropical abscess is an abscess of the liver in an inhabitant of a hot country.

There are three forms of abscess of the liver: traumatic, pyemic, and tropical.

**Traumatic abscess** may result from a wound of the liver or may follow a contusion without a break of the skin. In the latter case bacteria from the blood are arrested in the injured liver tissue. Such an abscess is usually solitary. Streptococci, staphylococci, or colon bacilli may be found.

**Pyemic Abscess.**—Multiple abscesses exist. It is frequently due to suppurative inflammation of radicles of the portal vein, infected emboli forming and reaching the liver; may follow ulceration of the intestine, hemorrhoids, or appendicitis. Occasionally abscess may arise from the extension of an infective process, such as pylephlebitis, or in cholelithiasis with obstruction. In

\* G. B. Johnston, *Annals of Surgery*, October, 1897.

these latter cases both the bacillus typhosis and the pneumobacillus of Friedländer have been found as the direct bacterial agent. Colon bacilli are a common cause. Echinococcus cyst of the liver may suppurate and form abscess. The round-worm, the liver fluke, and the balantidium coli sometimes cause abscess, and, finally, it has been observed in measles, epidemic influenza, and perforating ulcer of the stomach.\*

**Tropical Abscess of the Liver.**—Tropical abscess of the liver is rare in temperate climates, but is extremely common in the tropics. Its usual antecedent in either climate is dysentery. The reason for the great frequency of the disease in tropical regions is that the chief causative agent, the amœba coli, is found widely distributed in hot countries; and that passive congestion of the liver is a common condition among the white inhabitants of tropical regions. It has been pointed out that tropical abscess is particularly common among white persons that abuse alcohol, the condition of passive congestion of the liver making that organ a nutritious soil for a fruitful infection. Predisposing factors are also malaria and chilling of the surface of the body.

Captain Charles F. Kieffer, U. S. A.,\* in a lecture on tropical abscess of the liver, states that in his own experience he found, in a series of 33 abscess cases in soldiers, that dysentery was present in every case; and that in a second series of 25 cases in natives and civilians, he elicited a history of dysentery in 22 cases. Some observers—notably McLeod—state that dysentery is the antecedent factor in 97.5 per cent. of cases. Kieffer points out that in all the figures allowance must be made for a number of latent dysenteries, as well as for cases in which no effort was made to elicit a history of dysentery one or two years previously. It is also to be remembered that a case of amebic infection of the colon may have been so mild in the beginning as to have caused but a transient diarrhea, which the patient may have forgotten. Again, as Kieffer observes, amebæ occasionally exist in the colon without producing any dysenteric evidences. His conclusions are that from 20 to 25 per cent. of severe amebic dysenteries lead to the formation of abscess of the liver, and that at least 85 per cent. of all tropical abscesses are due to infection with the amœba coli. Occasionally, an abscess begins very soon after the dysentery; but, as a rule, it does not take place for some time afterward—weeks, months, a year, or even two years.

When an abscess of this sort forms in the liver, that organ becomes enlarged and congested, and an area or areas of necrosis exist in it. But one abscess may be present; there may be an abscess with satellite abscesses about it; several abscesses may coalesce, making a very large cavity; or genuine multiple abscesses may exist. In about 70 per cent. of cases, however, the tropical abscess is solitary (Kieffer).

The right lobe of the liver is the region most frequently involved. The abscess is found in the right lobe in from 70 to 80 per cent. of cases; and it is more often toward the convexity of the liver than toward the base.

An abscess of the liver contains characteristic and peculiar material; it is different from the pus found in other abscesses, and, in fact, is not pus, but is necrotic liver-substance. Liver abscesses due to pyogenic organisms contain true pus; a tropical abscess, free from pyogenic infection, does not.

\* Capt. Chas. F. Kieffer, U. S. A., in Phila. Med. Jour., Feb. 21, 1903.

† Phila. Med. Jour., Feb. 21, 1903.



Ordinary pus contains hordes of leukocytes; but the pus of a tropical abscess contains very few. Riesman is of the opinion that the reason there are so few leukocytes is that the abscess contains a substance that, by chemiotaxis, repels leukocytes. The pus is of a reddish-brown color, is thick, and frequently contains some blood or a little yellowish pus. Occasionally it is offensive in odor. Microscopic examination shows it to contain portions of necrotic liver-tissue, some liver-cells that are not destroyed, elastic tissue, blood, pus-cells, and amebæ (Kieffer). On bacterial examination it may be found that the pus is infected, containing staphylococci, streptococci, or pyogenic bacteria. In about 20 per cent. of the cases the pus contains neither bacteria nor the amœba coli. In nearly 60 per cent. of the cases the pus is free from bacteria. In cases in which the fluid is sterile it is probable that bacteria were originally present, but have died. The reason for the death of micro-organisms in this pus is in great doubt; because, as Riesman points out, bile cannot kill them, and organisms may be grown in the pus. Kieffer says that in the large majority of cases amebæ are readily demonstrable in the pus; but that in some few cases it is necessary to rub a piece of gauze on an abscess-wall in order to obtain amebæ, and that in others they can be demonstrated only after the abscess has been discharging for some days. The causative rôle of the amœba has been doubted by some observers, but most surgeons who have had experience in the tropics believe it to be a fact.

*Symptoms.*—The symptoms may be very definite and positive; they are frequently misleading and obscure; and in some cases nothing whatever directs the surgeon's attention to the liver until the patient passes a huge quantity of pus at stool or coughs up an enormous amount of the characteristic material. If rupture takes place death usually ensues. As a rule, the symptoms of a tropical abscess are positive and marked.

Kieffer sums up the chief symptoms under four heads: fever, sepsis, enlargement of the liver, and pain. In about three-fourths of the patients fever and sweats are definitely present; in about one-fourth they are absent or are very trivial. The type of fever met with is what has been previously spoken of as hectic. Usually there is an evening rise, preceded by a chilly sensation or by a chill; and as the temperature begins to fall, toward morning, there is a profuse sweat. It is seldom that there is any violent chill, though there is frequently a slight one. The sweats are extremely exhausting. They may occur either during the night or in the daytime, according to the time in which the patient sleeps. Kieffer says that they should not be called night-sweats, but rather sleeping-sweats. In very chronic cases there may be no pyrexia. As a rule, the temperature resembles that of malaria, but it is not controlled by quinin and the blood is free from malarial parasites. Sometimes the temperature suggests typhoid, with the exception that from time to time there are episodes of subnormal temperature. The patient loses flesh and strength, the appetite fails completely, and the skin becomes pasty or dirty yellow.

The entire liver is usually enlarged, and the enlargement may be detected by percussion, and in some cases a hard, smooth area can be palpated. Sometimes the liver reaches as high as the third rib anteriorly, or to the spine of the scapula behind, and it may extend downward to the anterior superior spine of the ilium (Kieffer). It is rarely, however, that the enlargement

takes place in a downward direction; it is usually upward. In many cases the right side of the chest appears to be rather full, and sometimes there is actual obliteration of the intercostal spaces. If an abscess becomes adherent to the surface, there may be skin-edema and dusky discoloration. In very rare instances, if a very large abscess comes near the surface, fluctuation may be obtained. By auscultation it is frequently possible to obtain friction-sounds in the region of the diaphragm and the superior surface of the liver.

The liver becomes tender. This tenderness may be developed particularly by pressure upon the lower edge of the organ, and sometimes by pressure through the intercostal spaces. There is not always pain, but, as a rule, there is. The pain may be dull and heavy; but as the abscess nears the surface of the organ, the pain becomes sharp and lancinating. The pain is persistent and is not strictly localized, but radiates to the back, the right shoulder-blade, and the point of the shoulder. It is increased by pressure, coughing, sudden or violent movement, and is sometimes felt in the esophagus when food is swallowed. When the upper surface of the liver is involved, the patient breathes as if he had pleurisy; and pleurisy frequently does develop, with marked effusion.

Paralysis of the diaphragm rarely occurs in abscess of the liver; and the respiration is not much affected, unless the diaphragm of that side and the pleura become involved, though the patient frequently has a dry cough. A severe cough suggests that the abscess is on the convex surface of the organ. Such a cough is aggravated by recumbency. Kieffer points out that the patient lies on his right side, and almost on the right front aspect; the shoulder being drawn down and the right knee drawn up, to relieve the tension of the abdominal muscles. In about one-fourth of the cases of tropical abscess of the liver jaundice occurs; usually, however, it occurs only when the abscess is on the inferior surface. Jaundice does not occur unless the common or hepatic ducts are compressed or cholangitis exists. The leukocyte-count is of no particular help in the diagnosis, as there may or may not be a leukocytosis. The urine is usually scanty. Diarrhea is a common accompaniment, but constipation may exist, and nausea and vomiting are by no means unusual.

*Diagnosis.*—With an antecedent history of dysentery the diagnosis is easy. Without such a history, it is always difficult and may be impossible. In the tropics exploratory aspiration is freely used, but exploratory incision, with subsequent exploratory aspiration, if necessary, must be safer and more certain.

*Symptoms of Traumatic Abscess.*—Are similar to those of tropical abscess.

*Symptoms of Pyemic Abscess.*—The liver is enlarged and tender, there is slight jaundice, and the general symptoms of pyemia are present.

*Treatment of Tropical Abscess.*—Make an exploratory incision. If the abscess is adherent to the parietal peritoneum, and is not covered by liver-substance, at once proceed to operation. If it is not adherent, or is covered by a considerable layer of liver-substance, stitch the visceral peritoneum to the parietal peritoneum and postpone further interference for forty-eight hours. The operation consists in evacuating the pus with a trocar and cannula, incising the abscess, stitching its edges to the edges of the abdominal



wound, irrigating, and inserting a drainage-tube. If the abscess is covered by a layer of liver-tissue, after locating it with a cannula open into it with a cautery knife and arrest hemorrhage by packing. When the parietal and visceral layers of peritoneum are adherent, packing will arrest bleeding; if they are not adherent, packing will only push away the movable liver (John O'Connor). If pyothorax exists, resect a rib, open the pleural sac, and reach the abscess in the liver by an incision through the diaphragmatic pleura and the diaphragm (transthoracic hepatothomy).

*Treatment of Traumatic Abscess.*—Is the same as for tropical abscess.

*Treatment of Pyemic Abscess.*—Surgery is usually futile, because multiple abscesses exist. If pointing takes place, an operation should be performed.

**Hepatoptosis, Floating or Movable Liver.**—Hepatoptosis may be congenital, but is usually acquired. In a congenital case certain ligamentous supports of the liver are absent. In the following discussion the acquired form is the variety referred to. This condition is rare. Ninety-eight cases have been reported.\* It is a form of splanchnoptosis and is due to relaxation of the abdominal wall and stretching of the supports of the liver. It may occur alone, but it is more often a part of a general abdominal relaxation or of Glenard's disease, and often a kidney is movable, or uterine displacement or hernia may exist. The liver may descend into the lower abdomen, may be upside down (Demarquay), may rotate on its transverse axis (Griffiths), the anterior surface may become posterior, or the organ may lie with the superior surface in the right flank and the inferior surface looking to the left,† may be movable, or may be anchored by adhesions. It is most common in women. The liver is supported by ligaments and also by the inferior vena cava, which vessel is firmly adherent to the central tendon of the diaphragm (Faure), by the abdominal wall, and by the intestines (Glenard). The cause of the condition is in dispute. It can result from relaxation of the belly-wall, relaxation of the ligaments, enteroptosis, great enlargement of the gall-bladder, increase in weight of the organ, atrophy of the connective tissue between the liver and diaphragm, pregnancy, the growth of a liver tumor, and tight lacing. Either a strain, cough, or the dragging of an adherent tumor may be the exciting cause.

**Signs and Symptoms.**—An abdominal mass may appear suddenly after a blow or a strain, and if it does appear suddenly there is always pain in the hepatic region, nausea, and weakness. When the condition comes on gradually, there may be no symptoms for a long time, but as a rule there is some pain in the loin which becomes worse after exercise or effort. In rare cases jaundice appears, and occasionally there is ascites. The abdominal walls are relaxed and the signs of splanchnoptosis are manifest. When the patient stands, a transverse furrow of skin covers the lower part of the umbilicus (Glenard's sign). In most cases the shape, the movability, and the absence of the liver from its proper position are diagnostic. Even when the organ is dislocated and attached in its new situation it is missed from its proper abode and palpation outlines the characteristic shape. When the patient lies down the liver usually returns to place, and in most cases it can be restored by manipulation. In some cases, however, it will not return

\* J. H. Carstens, Jour. Am. Med. Assoc., May 17, 1902.

† Terrier and Auvray, Rev. de Chir., Aug. and Sept., 1897.



to place and cannot be restored by manipulation. The floating liver causes a recognizable enlargement in the right loin, and the mass moves on respiration.

**Treatment.**—In many cases the patient can be kept comfortable by wearing an abdominal support, and can be distinctly improved by the use of massage and electricity to the abdominal wall, the administration of tonics, and a course of forced feeding. If these means fail, and the patient suffers, an operation should be performed. The operation of hepatopexy was devised by Marchant. He opens the abdomen and tries to restore the liver to its proper position. This can usually be accomplished. In some cases it can be done after adhesions have been separated. In other cases it can be only partially accomplished. After the liver has been restored, he sutures it by means of catgut or silk to the abdominal wall or costal cartilages, the stitches passing through the hepatic parenchyma and being carried through the liver by means of a round and blunt needle. The sutures attaching the liver to the belly-wall are tied beneath the skin. Marchant scarifies the dome of the liver in order to favor adhesions. Ramsay rubs the upper surface of the liver with gauze to promote adhesion and transfixes the round ligament with a suture which is carried around the cartilage of the seventh rib. In a severe case follow Depage's advice and associate hepatopexy with an excision of a portion of the abdominal wall to amend relaxation (laporectomy). If in operating on a floating liver it is found impossible to get the liver back into its normal position, fix it with sutures as near its proper abode as is possible. Terrier and Auvray report 11 cases of hepatopexy. One case died and eight completely recovered.

**Floating Hepatic Lobe (Partial Hepatoptosis).**—This condition is not uncommon in cases of chronic disease of the gall-bladder and is most often met in cholelithiasis. It is believed that it can be caused by tight lacing. A tongue-like projection forms upon the right lobe of the liver (linguiform lobe). It can be palpated below the costal margin and the dulness of the mass on percussion is continuous with liver-dulness. A linguiform lobe can usually be moved laterally and forward and backward; it is always tender and is sometimes the seat of pain.

**Treatment.**—When this condition is associated with gall-bladder trouble, it may disappear, or at least cease to cause pain, when the gall-bladder is drained by cholecystotomy. Langenbuch has successfully removed a linguiform lobe.

**Cholecystitis (Inflammation of the Gall-bladder).**—Inflammation of the gall-bladder is produced by infection. Healthy bile is sterile; and when bacteria are found in the bile, the condition is one of disease. Micro-organisms may find entrance into the gall-bladder by way of the blood, the bile becoming infected secondarily to the infection of the gall-bladder; or they may enter by way of the ducts, from the intestine. The conditions that follow infection depend upon the characteristic tendency and the virulence of the infecting germs. A trivial infection produces mucous catarrh; a more active infection causes supuration, and possibly ulceration; a very violent infection leads to gangrene.

In most cases of cholecystitis an inflammatory swelling blocks the cystic duct, and obstructs it so that the bile stagnates in the gall-bladder. In many cases this condition lasts but a short time; and when the obstruction

is relieved, bile flows down the duct. Occasionally, as a secondary consequence, cholangitis, or infection of the hepatic ducts, follows.\* Occasionally, also, the obstruction of the duct is not relieved; and a quantity of clear, thin mucus gathers in the gall-bladder and overdistends it—the condition known as hydrops. The gall-bladder may likewise become distended with pus, constituting an empyema of the gall-bladder; and any overdistended gall-bladder may rupture. In cases of very chronic inflammation of the gall-bladder, this structure becomes fibrous and contracts, until it may become no larger than the thumb, in which condition it may contain a very small amount of thickened bile. In some inflammatory conditions due to infection the bile mixes with thickened mucus, and micro-organisms form the nucleus upon which bile-salts are deposited. Thus are gall-stones formed (McFarland). As the same author points out, cholelithiasis may result from cholecystitis, and may cause chronic cholecystitis; because the stones existing in a gall-bladder are sources of irritation.

**Bacteriology of Cholecystitis.**—It has been proved by abundant observation that the fact that bile contains micro-organisms is no evidence that the gall-bladder is inflamed; but that when the gall-bladder is inflamed, micro-organisms are demonstrable in the bile. We know that the bile is infected during the course of typhoid fever, and that it is frequently so in pneumonia. The colon bacillus is not unusually demonstrable in cholecystitis; and pus-germs, either in pure culture or mixed with other germs, constitute the most common cause of the inflammation. It is probable that bacteria entering the gall-bladder and not being particularly virulent produce no immediate harm when the flow of bile is unobstructed, though even then they may become the nuclei of gall-stones; but if the bacteria are very virulent, they may actually lead to obstruction. Stagnation of the bile favors infection, and infection may be the cause of stagnation. Each influence reacts upon the other and aggravates the other, and it seems more than possible that infection of the gall-bladder is to be regarded as serious only when there is obstruction to the outflow of bile. The same variety of germ may, under some circumstances, cause catarrhal, and under others suppurative, inflammation; that is, when bacteria are virulent and tissue resistance is slight, suppurative cholecystitis results; but when the bacteria are not virulent and the tissue-resistance is powerful, the gall-bladder is not infected at all, or only catarrhal inflammation is produced.

**Catarrhal Inflammation of the Gall-bladder and Bile-ducts.**—

This condition is known as catarrhal jaundice, acute or chronic, and is usually treated by the physician; but, as A. W. Mayo Robson points out, chronic catarrhal jaundice sometimes resembles the jaundice of organic disease, and is occasionally associated with gall-stones, malignant disease, or hydatid cyst. Therefore, in a case of chronic catarrhal jaundice in which medical treatment fails, surgical treatment must be considered.

**Catarrhal Cholecystitis.**—This is a catarrhal inflammation of the gall-bladder without jaundice. The gall-bladder becomes thick and its mucous membrane is frequently plicated. Very thick mucus is secreted, which gathers in masses, and the descent of these plugs causes pain that is sometimes indistinguishable from that produced by the passage of a gall-

\* Joseph McFarland, Proceedings of the Phila. Co. Med. Soc., Sept., 1902.



stone. Such a plug may temporarily block the cystic duct. In catarrhal cholecystitis the gall-bladder is frequently distended, but rarely admits of palpation; and there are no adhesions to surrounding structures, unless gall-stones have been present (Robson). Catarrhal cholecystitis may lead to the formation of gall-stones; may result from the presence of gall-stones; or may be found in cases in which gall-stones have been present, but have passed. In one case upon which I operated, the gall-bladder was enlarged, thick, and without adhesions; the mucous membrane was convoluted; and the viscus was filled with thick, tenacious mucus, and the mucous membrane of the gall-bladder contained many minute concretions. In this case stone-formation was probably beginning to follow upon catarrhal cholecystitis. In another case a woman had presented violent symptoms of gall-stone colic, and stones had been recovered from the feces; but on opening the gall-bladder no stones were found—only a condition of catarrhal cholecystitis. Jaundice is rare in catarrhal cholecystitis, unless gall-stones are present; it is, however, occasionally noted. Even if jaundice does occur, it is slight and lasts but a short time. The painful attacks that occur during catarrhal cholecystitis are similar to gall-stone attacks; but the pain is less violent and of briefer duration, and jaundice is not apt to follow the passage of a plug of mucus and is apt to follow the passage of a gall-stone. Further, as Robson has shown, in cholecystitis with gall-stones there is usually tenderness on pressure over the gall-bladder; and there is rarely tenderness in uncomplicated catarrhal cholecystitis.

**Treatment.**—The majority of the cases recover under medical treatment. If a case fails to recover under medical treatment, one cannot be sure whether there are gall-stones or not; but an operation is indicated in either case. Cholecystotomy should be performed, and the gall-bladder should be drained for a week or two. This treatment will almost always produce cure.

**Croupous Inflammation of the Gall-bladder and the Bile-ducts.**—This is an extremely rare condition due to the formation of a thick membrane in the bile-passages, which causes obstruction to the flow of bile and spasmodic contraction of the gall-bladder. The symptoms are identical with those of gall-stones. Robson points out that a study of the evacuations may discover membranous intestinal casts; and that, as membranous enteritis is usually associated with croupous inflammation of the gall-bladder and bile-ducts, a diagnosis may thus be reached. The same author says that one may, in some cases, even find a cast of the gall-bladder in the evacuations.

**Treatment.**—If medical treatment fails, cholecystotomy should be performed and drainage should be employed for a considerable time.

**Suppurative Inflammation of the Gall-bladder and Bile-ducts.**—Adopting the classification of Mr. Robson, we divide these suppurative inflammations into simple suppurative cholecystitis, suppurative and infective cholangitis, phlegmonous cholecystitis and gangrene of the gall-bladder, ulceration of the gall-bladder and bile-ducts, pericystic abscess with adhesions, and certain consequences of these conditions, such as stricture of the gall-bladder and bile-ducts, perforation of the gall-bladder and bile-ducts, and fistula of the gall-bladder and bile-ducts. Suppurative inflammations of the gall-bladder and the bile-passages are due to infection

with virulent organisms or to infection when the tissue-resistance is at a low ebb.

One fact must strike the physician in regard to these cases; that is, that there is a strong similarity between the possible changes of acute cholecystitis and the possible changes of acute appendicitis. In the gall-bladder, as in the appendix, there may be a catarrhal inflammation, which may not advance beyond this stage, or which may advance into a more dangerous form; in each structure, blocking and stagnation favor infection and aggravate existing infection; in each, there may be suppuration, ulceration, gangrene, and perforation; in each, there may be grave complications and disastrous and fatal consequences; and in each, prompt surgical operation is often life-saving.\*

**Simple Suppurative Cholecystitis.**—This condition is also spoken of as suppurative catarrh of the gall-bladder, or simple empyema of the gall-bladder. It is a rare condition, unless gall-stones exist, or unless some infectious disease—especially typhoid fever—has antedated the condition. It is not only typhoid fever that may be causative, but also other continued fevers. No matter, however, what organism is primarily responsible,—be it colon bacillus, typhoid bacillus, or what not,—a mixed infection with pyogenic organisms takes place. In simple suppurative catarrh of the gall-bladder when the duct becomes blocked, the condition known as simple empyema exists; and when hydrops of the gall-bladder undergoes suppuration, simple empyema is produced.

In an ordinary case of suppurative catarrh following gall-stones, one usually obtains the history of a number of attacks of biliary colic, the pain finally having become persistent, instead of intermittent; and a definite swelling being palpable in the gall-bladder region. This swelling is tender on pressure. There are usually constitutional symptoms; sometimes trivial, often severe. The trivial symptoms are a somewhat rapid pulse, sweating at night, and some elevation of temperature. The more severe symptoms are chills, a remittent fever, and profuse sweats. The development of severe symptoms indicates that a dangerous change is taking place; usually ulceration of the gall-bladder, occasionally phlegmonous cholecystitis. Distinct jaundice is rare in simple empyema, though the patient usually shows loss of flesh, has a very poor appetite, and suffers considerably from thirst.

To distinguish an enlarged gall-bladder from any other intra-abdominal mass is sometimes difficult. An enlarged gall-bladder moves on respiration, unless the mass becomes adherent to the abdominal walls, when it will cease to do so. An enlarged gall-bladder is sometimes mistaken for a movable kidney, and the diagnosis between these conditions is discussed in the section on Movable Kidney (page 934).

**Treatment.**—The gall-bladder should be opened and drained by the operation of cholecystotomy. After it has been exposed, it is packed about with gauze pads, a considerable amount of the contents is removed through an aspirator, the gall-bladder is opened and irrigated with salt solution, and a search is made for any cause of obstruction in the cystic duct. This cause should be removed; and any gall-stones that are present should, of course, be taken away. The walls of the gall-bladder will frequently be

\* The Author: Proceedings of the Phila. Co. Med. Soc., Sept., 1902.



found diseased and softened, so that it is impossible to apply stitches. In some cases, if the gall-bladder is badly diseased, it should be removed; but in others, cholecystotomy with drainage is sufficient.

**Recurrent Simple Empyema of the Gall-bladder.**—In this condition a person develops, at intervals, pain, fever, tenderness, and enlargement of the gall-bladder. Then the symptoms clear up, he is well for a time, but they finally recur; and at last they may become persistent or violent, because of the development of some complication. In these cases it becomes impossible, after a number of attacks, to palpate any enlargement of the gall-bladder; and when an operation is performed, the gall-bladder is found shrunken, thickened, and deeply placed, containing some purulent matter, and strongly fixed to the surrounding structures by adhesions.

**Treatment.**—Cholecystectomy is usually the proper operation.

**Acute Phlegmonous Cholecystitis.**—Some call this condition acute empyema. It is extremely dangerous, and is apt to cause gangrene of the gall-bladder. It is due to infection with extremely virulent organisms. It may produce rapid peritonitis and death without perforation, but oftener perforation takes place. It is usually associated with the presence of calculi, but sometimes none are found; and the condition sometimes develops during typhoid fever or septicemia.

This disease begins with sudden and violent pain in the gall-bladder region. This pain usually radiates toward the right shoulder-blade, and soon becomes general throughout the abdomen. There is tenderness in and great rigidity over the gall-bladder region, thoracic respiration, exhausting vomiting, septic fever, and in some cases jaundice. If an operation is not promptly performed, general peritonitis quickly takes the patient's life. In one case upon which I operated there were intense jaundice, tenderness, violent pain, abdominal rigidity and distention, chills, and septic fever; and when the abdomen was opened, it was found that a portion of the gall-bladder was gangrenous and that a calculus projected through the gangrenous opening.

It is this form of cholecystitis that is especially likely to be mistaken for appendicitis. In making a diagnosis, the situation of the primary pain is of importance, and likewise the situation of the tenderness; but a displaced gall-bladder or an abnormally situated appendix will lead to error. Acute phlegmonous cholecystitis is usually accompanied by absolute constipation, and the sudden onset and the abdominal distention may lead to the disease being mistaken for intestinal obstruction. It may also be confused with perforating ulcer of the stomach or of the duodenum.

**Treatment.**—In any case of doubt, an exploratory incision should be made. If phlegmonous cholecystitis is found to exist, the gall-bladder should, whenever possible, be extirpated; but if the desperate condition of the patient forbids this operation, it should be surrounded with iodoform gauze and a drainage-tube should be carried well up toward the cystic duct.

**Pericystic Abscess.**—Pericystic abscess is a condition that may follow infection of the gall-bladder. It is especially common in the condition known as recurrent simple empyema. When a pericystic abscess exists the localized abdominal tenderness is great and the temperature is usually indicative of suppuration. The causative micro-organisms may have passed

through a diseased gall-bladder wall, rupture not existing; or the abscess may follow ulceration or perforation of the gall-bladder wall.

**Treatment.**—Operation should invariably be performed, though it is frequently difficult. After a pericystic abscess has been drained, it will be found necessary in some cases to extirpate the gall-bladder; whereas in others, cholecystotomy and drainage will prove sufficient.

**Suppurative and Infective Cholangitis.**—The usual cause of infective cholangitis is gall-stones lodged in the common duct, particularly those cases in which a gall-stone acts as a ball-valve. A. W. Mayo Robson, though he believes that infective cholangitis does occur when the gall-stones are freely movable in the common duct, sets it forth as his experience that it is much more common in such cases to find gall-stones impacted in the common duct.

In such cases the patient gives a history of attacks of gall-stone colic without jaundice for several years, and then of attacks followed by temporary jaundice. Finally comes an attack that is followed by a chill and fever; and jaundice, varying in intensity, ensues upon this, but it now almost never completely disappears between the attacks of pain. Robson points out that the interval between the attacks may be short or long, and that the rigors may be repeated daily or at uncertain intervals; that the gall-bladder is usually, but not always, contracted; and that after the condition has persisted for some time, the liver becomes distinctly enlarged. There is tenderness over the gall-bladder or in the epigastric region, loss of flesh, and persistent jaundice.

Infective cholangitis, even after it has lasted for a considerable length of time, may be recovered from; but it may pass on into an acute condition in which poisoning takes place from the biliary elements, suppurative cholangitis may arise, an empyema of the gall-bladder may develop, and there may be an abscess of the liver or some other dangerous or fatal complication. The ague-like attacks of infective cholangitis have been called by Charcot *intermittent hepatic fever*.

**Treatment.**—After an incision has been made, the duct is opened and the cause removed; but, as Mayo Robson points out, the complication should be anticipated. When one finds that carefully applied medical treatment has failed to free the patient of gall-stones, they should be removed surgically.

**Suppurative Cholangitis.**—Suppurative cholangitis is usually a development of ordinary infective cholangitis, which has just been discussed. Among the other causes that Robson sums up are acute infectious diseases, particularly typhoid fever and influenza: cancer of the bile-ducts; and hydatid disease.

In this condition the liver enlarges notably and becomes tender. In some cases there is an empyema of the gall-bladder, but this is rare; in fact, the gall-bladder is usually very much shrunken. When, in a chronic case, there is enlargement of the liver, blocking of the common duct, and enlargement of the gall-bladder, the inference is in favor of cancerous obstruction of the common duct. If the obstruction is due to cancer, there will usually be little pain; but when it is due to gall-stones, there will be violent attacks of pain, accompanied by rigors and fever, with deepening of the jaundice. In this disease there is always jaundice, usually unfading;



but in cases of ball-valve gall-stone in the duct, it may be mitigated from time to time. The patient suffers with septic fever and very rapid loss of flesh.

The condition is generally fatal, unless operation is performed early. There is a strong tendency for abscess of the liver to form, and in one case upon which I operated, a subphrenic abscess had developed.

**Treatment.**—Cholecystotomy with free and prolonged drainage. If an abscess of the liver exists, it should also be drained. If gall-stones are gathered in the common duct, they should, of course, be removed.

**Gall-stones.**—Gall-stones are formed during life in the gall-bladder or bile-ducts by the agglutination of materials which have precipitated from bile. The nucleus of a gall-stone may be a mass of bacteria, a blood-clot, epithelium, crystals of cholesterin or carbonate of lime, or a cast of a small duct.\* The condition of the body which leads to the formation of gall-stones is designated by the term *cholelithiasis* (Brockbank). But one stone may be present or great numbers may exist. Solitary stones may be nearly round or cylindrical. When several stones or many stones exist the mutual pressure often leads to the formation of facets (Naunyn). In color calculi may be pale yellow, green, black, or brown. Some are heavier than bile and some are lighter. Brockbank gives the following varieties of gall-stones: pure cholesterin stones, stratified cholesterin stones, common or gall-bladder calculi, mixed bilirubin calcium calculi, pure bilirubin calcium calculi, and certain rare forms.† Gall-stones usually take origin in the gall-bladder, but may arise in the common duct, the cystic duct, the hepatic duct, or the smaller ducts of the liver. As a rule, however, calculi in the common or cystic duct were not formed there, but were transported from the gall-bladder or hepatic ducts.

**Causes.**—Gall-stones are very commonly found post-mortem. In Germany it is estimated that they are found in 12 per cent. of all cases. In 1655 autopsies in the Johns Hopkins Hospital gall-stones were present in 6.94 per cent. of all cases.‡ The cause is a catarrhal condition of the bile-ducts, due particularly to the entrance of bacteria from the intestine (colon bacilli, typhoid bacilli, pus organisms, pneumococci). This catarrhal condition causes stagnation of bile. Experimental infection of the gall-bladder producing mild cholecystitis is almost always followed by gall-stone formation.§ Welch pointed out that recent gall-stones have bacteria in their center. Cushing tells us that 30 per cent. of gall-stone cases operated upon in the Johns Hopkins Hospital had previously suffered from typhoid fever, but Mayo's experience is not in accord with this view. Thirty per cent. of Ochsner's cases had had appendicitis.

The chief predisposing causes are advancing years, insufficient exercise, the consumption of an excess of nitrogenous food, gouty tendencies, conditions which interfere with the emptying of the gall-bladder, cardiac disease, and cancer of the liver. Gall-stones rarely form before the age of thirty-five. The disease is more common in the insane than in the mentally sound, in the

\* Bevan, in *Chicago Med. Recorder*, April, 1898.

† Brockbank's treatise on "Gall-stones."

‡ C. D. Mosher, in *Johns Hopkins Hosp. Bull.*, Aug., 1901.

§ Gilbert, in *Archives générales de méd.*, Aug. and Sept., 1898.

white race than in the black, and in women than in men. In 25 per cent. of all females beyond sixty years of age gall-stones are present (Naunyn). The special liability of women may be brought about by tight lacing, pregnancy, inactivity, or movable right kidney. There are two forms of the condition to be considered. The acute type, due to efforts made by the gall-bladder or duct to expel the concretion; and the chronic condition, in which a calculus is lodged for a long time, or in which, as soon as one calculus is passed into the intestine, "another begins its journey" (Brockbank). The fact that bacteria cause the condition must not lead us to infer that pus is formed. The bacteria are present in small numbers or else their virulence is greatly mitigated, they produce only catarrhal inflammation, quantities of cholesterin are secreted, the bile stagnates, and a stone forms. In many cases the stone or stones never cause trouble. A gall-stone may begin to descend because of violent muscular exertion, external pressure, or at the onset of a fresh inflammation which leads to loosening of the stone. A very small stone usually passes freely. A larger stone in passing causes colic. A still larger stone remains in the gall-bladder, or becomes fixed in the cystic duct or the intestinal outlet of the common duct.

**Symptoms.**—The formation of a stone requires several months, and during the antecedent period of gastro-intestinal catarrh, "the prodromal state" of Kraus, certain symptoms may exist, viz.: constipation, flatulence, loss of appetite, migraine, uneasy sensations in the epigastrium or right hypochondrium, sallowness of the skin, slight yellowness of the conjunctivæ, scantiness of urine, which excretion is saturated with uric acid, and may after a time contain a little bile. If this condition is not arrested by treatment, it grows worse. The abdomen becomes decidedly distended; pressure over the stomach or liver may cause distinct uneasiness, or even pain; acid indigestion is very troublesome, violent attacks of migraine occur, constipation becomes more decided, the feces become clay-colored, gastralgia may occur, the skin is apt to be slightly jaundiced, itching is complained of, the patient is irritable and sleeps poorly. The liver is found to be enlarged, and the urine contains distinct amounts of bile. When the patient reaches this stage gall-stones are very liable to form. These symptoms may pass away even if a concretion forms. It is quite true that in some cases a stone exists for years without causing trouble; but it may greatly aggravate the condition. When a stone forms pain is apt to become a marked feature of the case. A sense of pressure or of soreness in the hepatic region has added to it sudden and transient paroxysms of pain, due to the passage of thick bile from the gall-bladder and small ducts, or of gravel from the small ducts urged on by bile-pressure. When a stone begins to pass from the gall-bladder violent colic is experienced. Such a colic usually comes on very suddenly, and often about three hours after a meal. It may, however, come on gradually, the patient complaining greatly of flatulence. The pains are violent, spasmodic, and paroxysmal, and over the hepatic and epigastric regions, "radiating upward over the right half of the thorax" (Kraus), and passing particularly from the epigastrium to the right shoulder-blade. The patient is profoundly nauseated, and usually vomits, the abdomen is distended, and a condition almost of collapse is soon reached. The attack lasts a variable time, and terminates by the stone passing into the intestine or falling back into the bladder. After its conclusion, if the feces are



examined carefully during several days, the stone may be discovered. The fact that no stone is discovered does not prove that no stone was passed, because a cholesterin stone will be destroyed in the intestinal canal. Jaundice almost invariably follows the attack in about twenty-four hours and lasts several days: If the stone is impacted, after a time the pains become less violent, but again and again the patient suffers from aggravation of them. An individual may get about with impacted stone, but again and again fierce attacks of colic occur, and if the stone is in the common duct the patient becomes and remains deeply jaundiced. In certain cases attacks of gall-stones are accompanied by febrile seizures resembling malaria and called *hepatic fever*. The fever may be intermittent, a chill or chills often occur, there is jaundice and tenderness of the liver. The fever is due to intoxication with ptomaines from infected bile retained in the ducts by obstruction. The condition is ominous because it is due to infection.

If a stone lodges in the cystic duct, it does not cause jaundice. It grows in size from incrustation, prevents the entrance of bile into the gall-bladder, and the bladder becomes filled with mucus (hydrops of the gall-bladder). If a bladder so blocked becomes infected, pus forms, and the condition known as empyema of the gall-bladder exists. An empyema of the gall-bladder may rupture into the bowel, the peritoneal cavity, or even through the skin.

The common duct is involved in 1 out of 5 or 6 cases.\* If a stone blocks the common duct, jaundice always exists. Blocking may be complete, and the stone may ulcerate into the bowel or the peritoneal cavity. Blocking may be incomplete, the stone acting as a ball-valve and producing intermittent colic and jaundice (Christian Fenger). Fenger points out that if a stone remains fixed in the common duct the liver becomes tender and enlarged; but if a stone floats about in the common duct, the gall-bladder undergoes atrophy. In complete obstruction the stools become clay-colored and bilirubin is found in the urine.

Gall-stones may lead to suppurative inflammation of the gall-bladder or bile-passages, ulceration, occlusion of the neck of the gall-bladder, dilatation of the stomach from the formation of adhesions which kink the pylorus, abscess, peritonitis, empyema of the gall-bladder, and cancer of the gall-bladder. If the patient develops distinct infection of the gall-bladder or bile-ducts, he will suffer from chills, fever, and sweats.

Gall-stones may lead to cirrhosis of the liver. A stone may ulcerate into the bowel and cause intestinal obstruction. It may be difficult to make a diagnosis between gall-stones with icterus and cirrhosis of the liver with icterus. In the former case the urine contains bilirubin and in the latter case urobilin.

**Treatment.**—In the prodromal stage and after recovery from an attack insist on the patient taking considerable outdoor exercise. Direct him to take a cold sponge-bath every morning, to move the bowels freely every day, and to employ a simple diet. He should avoid all highly seasoned foods, pastry, rich soups, fatty food, cheese, alcohol, and sweets. Alkalies internally are of value.

During the attack give an enema, apply hot turpentine stupes over the hepatic region, and administer a hypodermatic injection of morphin and

\* Robson, in *Lancet*, April 12, 1902.

atropin. If vomiting does not occur, let the patient drink a large amount of warm water to favor it. After the attack administer a purgative.

When the attack has terminated examine carefully for any evidence of inflammatory trouble in the hepatic region.

In certain cases operation becomes necessary. Mr. A. W. Mayo Robson advises operation in the following cases:\* in frequently recurring biliary colic without jaundice, whether the gall-bladder is enlarged or not; in cases of enlargement of the gall-bladder without jaundice, even if there is no pain; in persistent jaundice which was ushered in by pain, painful seizures occurring, whether or not febrile attacks occur; in empyema of the gall-bladder; in peritonitis beginning in the gall-bladder region; in intrahepatic abscess and in abscess about the liver, gall-bladder, or bile-ducts; in some cases where the stones have been passed, but adhesions remain and produce pain; in fistula cases; in some cases of persistent jaundice due to obstruction of the common duct, although there may be a possibility of cancer existing; in phlegmonous cholecystitis and gangrene of the gall-bladder. Besides these conditions which may be produced by gall-stones, Robson operates for wounds of the gall-bladder, infective and suppurative cholangitis, and for some conditions of chronic catarrh of the bile-ducts and gall-bladder.† The tendency to operate early for gall-stones is growing. It is true that stones *may* cause no trouble, but sooner or later they are apt to, there is no tendency whatever to spontaneous cure, and medicine cannot dissolve them in the bladder. Early operations are easy and comparatively safe; late operations are difficult and dangerous, and by early operation dangerous complications (infection, adhesions, obstructive jaundice) are avoided. As Maurice H. Richardson ‡ says: An early operation is less dangerous than the passage of a stone; complications are avoided or lessened; even if the diagnosis is wrong the real condition may be found and removed. If obstructive jaundice exists, operation is dangerous because of the probability of fatal oozing of blood.

The common operation is cholecystotomy, which consists in opening the gall-bladder, removing the stones, and making a temporary fistula in the gall-bladder (page 819). The fistula is permitted to heal, hence we say cholecystotomy rather than cholecystostomy. After drainage gall-stones rarely re-form. The operation of incision, removal of the stone, and suture of the gall-bladder is known as cholecystendysis. If calculi exist in the common duct, it may be possible, after celiotomy, to manipulate them back into the bladder and extract them from that viscus with a scoop, but this maneuver is impossible unless the cystic duct is dilated. In some cases cholecystotomy is performed, a fistula is made, and the duct and bladder are frequently irrigated. In other cases the stone may be crushed by the fingers manipulating the duct and the concretion within it (choledocholithotriety). Robson points out that crushing of the stone is apt to leave fragments which may cause trouble, and it should be done only when the stones are soft. It is wrong to endeavor to force a stone from the common duct into the duodenum. The attempt will fail, and in some cases the patient will be placed in a worse condition

\* Mayo Robson on the "Gall-bladder and Bile-ducts."

† Robson's treatise, from which the above is taken, is a valuable exposition of the surgery of the gall-bladder and bile-ducts.

‡ Boston Med. and Surg. Jour., Sept. 5, 1901.



by the stone lodging in Vater's diverticulum.\* The duct may be opened, and after the removal of the stone closed by sutures or drained for a time, strands of gauze being carried down to the opening and in some cases a tube being carried up a dilated duct toward the liver (choledochotomy). If the stone is impacted near the outlet of the duct, it may be necessary to incise the duodenum in order to remove the stone (choledochoduodenostomy). A dilated bile-duct may be anastomosed to the bowel (choledocho-enterostomy) or to the surface (choledochostomy). The obstruction may be side-tracked by anastomosing the gall-bladder to the bowel (cholecystenterostomy) (p. 820), or a dilated duct to the bowel (choledocho-enterostomy). Cholecystenterostomy affords drainage but does not remove the cause of trouble, and infection is apt to be received from the bowel. In some rare cases of common duct obstruction, in which the gall-bladder is distended and the condition of the patient is desperate, anastomose the gall-bladder to the colon (Robson). In some cases the gall-bladder is removed (cholecystectomy). Cysticotomy is incision of the cystic duct.

#### DISEASES AND INJURIES OF THE PANCREAS.

**Wounds and Injuries.**—The pancreas is very rarely ruptured alone, although this sometimes occurs as the result of blows or crushes. In the majority of cases in which the pancreas is damaged, other organs are involved; for instance, the stomach, the spleen, and the liver. A gunshot wound of the pancreas is almost certain to injure the left kidney, the stomach, or the vertebral column. It will be remembered that in the case of President McKinley the bullet passed through the stomach, damaged the left kidney, and injured the pancreas.

**Symptoms.**—When the pancreas is injured alone, hemorrhage is not usually severe; but if adjacent organs are also damaged, it is sure to be profuse. Hence, when adjacent organs are damaged there are apt to be immediate symptoms of severe intra-abdominal hemorrhage; but profound collapse is not often present when the pancreas alone is injured. In fact, symptoms may not arise for a considerable length of time after injury of the pancreas. A diagnosis at this stage is impossible without exploratory operation. Injury of the pancreas is usually, but not invariably, fatal. After slight damage of the gland, the patient may completely recover; but, as a rule, he partly recovers and, after a number of weeks, a smooth tumor, palpable in the epigastric region, is formed. When operation is performed, this tumor is found to be back of the stomach. It contains a quantity of blood, clot, and pancreatic fluid. Such a fluid collection is in the lesser peritoneal cavity and is called a cyst, though it is not a true cyst of the pancreas. Robson and Moynihan, in their valuable treatise on "Diseases of the Pancreas," explain the formation of this collection of fluid as follows:

The injury lacerates the posterior layer of the lesser sac of the peritoneum and the pancreas, to which it is adherent. Blood and pancreatic fluid enter the lesser peritoneal sac. Peritonitis follows. The foramen of Winslow is blocked by adhesions; and the lesser peritoneal cavity, being now a closed sac, is distended with a serous exudation mixed with blood and pancreatic

\* See A. W. Mayo Robson, in *Lancet*, April 12, 1902.